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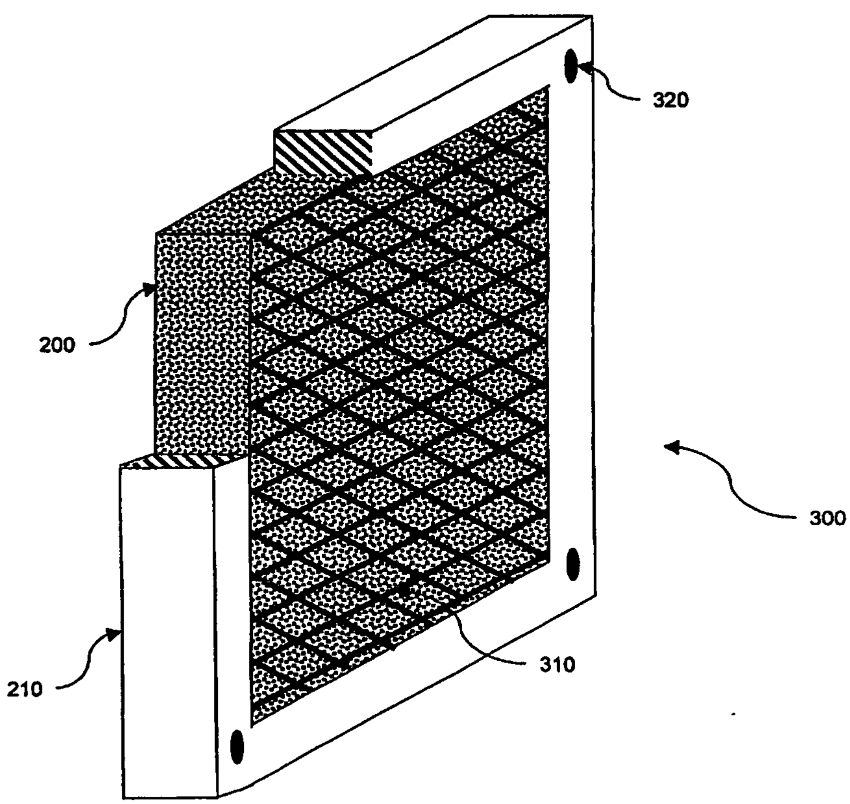
(54) Title: EMI-ABSORBING AIR FILTER



(57) Abstract: Electromagnetic-energy absorbing materials are used to treat air filters (300), such as those used in association with electronic equipment thereby suppressing the transmission of electromagnetic interference (EMI) therethrough. Disclosed are processes and materials for applying EMI-absorbing materials to air filters thereby improving EMI-shielding effectiveness in an economically efficient manner. In one embodiment, an absorptive solution (110) is prepared using an absorptive material and a binding agent. A heavy coating of absorbing solution is applied (120) to an air filter substrate (100), for example by dipping or spraying. Excess absorbing material is subsequently removed (130) and the absorbing material cured (140), such that the passage of air through the filter remains substantially unimpeded. The resulting absorptive air filter is then optionally treated (160) with a flame retardant to meet a predetermined safety standard.

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AMENDED CLAIMS

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1. An air filter having electromagnetic-energy absorptive characteristics, the filter comprising:

a porous substrate; and

an electrically absorptive material distributed substantially uniformly through the porous substrate, said electrically absorptive material being an electrical absorber in particulate form suspended in a binding agent.

2. cancelled

3. The air filter of claim 1, wherein the electrical absorber is selected from the group consisting of carbon, carbon particles, carbon fibers, alumina, sapphire, silica, titanium dioxide, ferrite, iron, iron silicide, graphite, and composites of iron, nickel and copper.

4. The air filter of claim 1, wherein the binding agent is selected from the group consisting of an elastomer, a rubber and an epoxy.

5. The air filter of claim 1, wherein the electrically absorptive material further comprises a highly conductive material.

6. The air filter of claim 5, wherein the highly conductive material is selected from the group consisting of copper and aluminum.

7. The air filter of claim 1, further comprising a fire-retardant layer.

8. The air filter of claim 7, wherein the fire-retardant layer comprises a fire retardant selected from the group consisting of phosphates and antimony trioxide.

9. The air filter of claim 7, wherein the fire-retardant-treated porous substrate passes a self-extinguishing vertical burn requirement in accordance with Underwriters Laboratories Standard 94.

10. The air filter of claim 1, wherein the porous substrate comprises an open-cell reticulated polyurethane foam.

11. The air filter of claim 10, wherein the foam comprises at least about 10 pores per linear inch.

12. The air filter of claim 1, wherein the porous substrate comprises a fiberglass mat.

13. The air filter of claim 1, wherein the porous substrate comprises a non-woven polyester web.

AMENDED SHEET (ARTICLE 19)

14. The air filter of claim 1, further comprising an electrically conductive layer.

15. The air filter of claim 14, wherein said electrically conductive layer is an electrical conductor having an array of apertures through which air can flow.

16. The air filter of claim 14, wherein said electrically conductive layer is a conductive coating applied thereto.

17. The air filter of claim 14, wherein the electrically conductive layer comprises a honeycomb.

18. The air filter of claim 1, further comprising a frame fixedly attached to the porous substrate, wherein the frame provides physical support for the porous substrate.

19. The air filter of claim 1, wherein the porous substrate comprises a sheet having a thickness less than about 0.5 inches.

20. The air filter of claim 1, wherein the porous substrate provides at least 20 dB of attenuation to electromagnetic energy substantially occurring at frequencies at least between about 4 GHz and 18 GHz.

21. A method for producing an air filter having electromagnetic-energy-absorptive

characteristics comprising the steps of:

providing a porous substrate having a first side and a second side;

providing an electrically absorptive solution, said electrically absorptive solution being an electrical absorber in particulate form suspended in a liquid binding agent;

applying said electrically absorptive solution to the porous substrate;

distributing said electrically absorptive solution substantially uniformly through the porous substrate; and

curing said electrically absorptive solution.

22. The method of claim 21, wherein the applying step comprises the sub-steps of:

immersing the porous substrate into the electrically absorptive solution, causing the electrically absorptive solution to penetrate the porous substrate;

extracting the immersed porous substrate from the electrically absorptive solution; and

removing excess electrically absorptive solution from the extracted porous substrate, thereby leaving a substantially uniform distribution of electrically absorptive solution through the porous substrate.

23. The method of claim 21, wherein the electrical absorber is selected from the group consisting of carbon, carbon particles, carbon fibers, alumina, sapphire, silica, titanium dioxide, ferrite, iron, iron silicide, graphite, and composites of iron, nickel and copper.

24. The method of claim 21, wherein the binding agent is selected from the group consisting of an elastomer, a rubber and an epoxy.

25. The method of claim 21, further comprising the step of forcing air through the porous material during at least one of prior to curing and curing, thereby ensuring that pores remain substantially unblocked.

26. The method of claim 25, wherein the step of forcing air through the porous material comprises drawing a vacuum.

27. The method of claim 22, wherein the step of removing excess electrically absorptive solution comprises squeezing the extracted porous substrate.

28. The method of claim 21, wherein the step of applying an electrically absorptive solution is repeated.

29. The method of claim 21, further comprising the step of applying a fire-retardant layer.

30. The method of claim 29, wherein the fire-retardant layer comprises a fire retardant selected from the group consisting of phosphates and antimony trioxide.

31. The method of claim 21, wherein the applying step comprises:

spraying the electrically absorptive solution onto the first side of the porous substrate; and

removing excess electrically absorptive solution from the sprayed, porous substrate, thereby leaving a substantially uniform distribution of electrically absorptive solution through the porous substrate.

32. The method of claim 31, further comprising the step of spraying the electrically absorptive solution onto the second side of the porous substrate.

33. The method of claim 21, wherein the air-flow characteristics of the porous substrate are substantially equivalent before and after the application of the electrically absorptive solution.

34. The method of claim 21, wherein a reduction in air-flow capacity of the porous substrate when compared before and after the application of the electrically absorptive solution is preferably less than 25%.

35. The method of claim 21, wherein a reduction in air-flow capacity of the porous substrate when compared before and after the application of the electrically absorptive solution is more preferably less than 15%.

36. The method of claim 21, wherein a reduction in air-flow capacity of the porous

substrate when compared before and after the application of the electrically absorptive solution is even more preferably less than 10%.